

## Application Scenario 62.01: Simulation of the buildup of laser oscillation without gain

### Abstract

In this application scenario we simulate and visualize the buildup of laser oscillation based on the Fox-Li algorithm.

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<b>Keywords:</b>	laser resonator, Fox-Li, laser oscillation
<b>Requirements:</b>	VirtualLab version 4.6.0 or higher – <b>Laser Resonator Toolbox</b>
<b>Scenario Version:</b>	1.1
<b>Sample Files:</b>	Corresponding files can be found <a href="#">here</a> .
<b>Related Scenarios:</b>	<a href="#">Scenario_08.01</a> , <a href="#">Scenario_09.01</a> , <a href="#">Scenario_12.01</a>
<b>Related Tutorials:</b>	<a href="#">FS.009</a>
<b>Related Talks and Articles:</b>	<a href="#">"Eigenmode and tolerance analysis for stable laser resonators."</a>

### Modeling Task

In this scenario we consider a resonator that consists of two spherical mirrors and an idealized lens, see the accompanying slides. We investigate the buildup of laser oscillation without gain for the resonator system and visualize the results as an animation.

### Solution with VirtualLab

The scenario provides a sample light path document of the resonator `Scenario_62_01_Resonator_LightPath.lpd`. The light path contains an eigenmode analyzer. This analyzer can be started via **Go!** in order to calculate the eigenmode. The iteration is started with a random phase that has been superimposed to the initial mode. We apply the Fox-Li algorithm to compute the eigenmode. As discussed by A.E. Siegman ("Lasers", University Science Books, Mill Valley, California, 1986), the Fox-Li iteration shows the buildup of laser oscillations. The iteration is monitored in the iteration document. Convergence can be observed looking at the beam radius or deviation values, for example. Furthermore, the mode in the reference plane is computed after each iteration.

## Results

The scenario provides the iteration document `Scenario_62.01_Resonator_Iteration.iter` with the results obtained via the Fox-Li algorithm. The results are shown in the accompanying slides.

## Technical Support

If you have any questions, remarks or problems concerning this application scenario, or in using VirtualLab in general, please do not hesitate to contact us by E-Mail [support@lighttrans.com](mailto:support@lighttrans.com).

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